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ABSTRACT

Error rates for individual words tested and for sound-to-spelling correspondences occurring within those words are reported for 18 tests given during a tryout of the Southwest Regional Laboratory (SWRL) First Grade Spelling Component. Several types of spelling errors are discussed, and suggestions are provided for reducing each type of error. Commonly occurring word element substitutions are listed. Whether or not other elements would be spelled correctly more often if contrasted with elements previously learned cannot be substantiated by analysis of the tryout results. (The results of the study are presented in both narrative and table form.) (Author/RB)

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AN ANALYSIS OF SPELLING ERRORS IN THE 1971 TRYOUT OF A FIRST GRADE SPELLING COMPONENT

Donna R. Schwab

ABSTRACT

Error rates for individual words tested and for sound-to-spelling correspondences occurring within those words are reported for 18 tests given during a tryout of a First Grade Spelling Component. Several types of spelling errors are discussed with suggestions for reducing each type of error. Commonly occurring word element substitutions are listed.

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AN ANALYSIS OF SPELLING ERRORS IN THE 1971 TRYOUT OF A FIRST GRADE SPELLING COMPONENT

SWRL's First Grade Spelling Component (Butler, 1971) was the vehicle to provide data for an analysis of spelling errors. Over a 21 week period, 18 spelling lists were presented and weekly tests were taken by children in four participating classrooms.[1] The total number of words tested was 178. This included 59 sight words and 34 transfer words. All other words were learned as initial consonants plus VC(C) word elements (e.g., d + en spells "den"). Although each weekly test began with one or two items testing initial consonants or word elements, only whole word spelling items are treated in this paper.

Table 1 indicates the number of students making no errors or no responses at all on tests given during each of three testing periods which correspond roughly to periods after which review tests were given (weeks 1-4, weeks 6-10, and weeks 12-21). It shows that tests given during weeks 1-4 were not difficult for many students. As more correspondences and rules were taught, perfect spelling papers were not as common but, by weeks 6-10, all except one student was able to produce reasonable answers for most items tested.

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[1]Because of time constraints at the close of the school year, only three classes took the weekly test during week 18, two classes during week 19, and one class during weeks 20 and 21.

TABLE I

OVERALL INDIVIDUAL PERFORMANCE ON WEEKLY TESTS

Testing Period	Students Making No Errors on Tests Taken	Students Producing No Answers on Tests Taken[2]	Students Making Spelling Errors	Total
Weeks 1-4	52	8	61[3]	121
Weeks 6-10	15	1	105[3]	121
Weeks 12-21	10	0	109	119

Of the possible responses from students present for testing over the 21 week period, 81% were correct responses, 5% were whole word omissions[2] and 14% were misspellings. Table II shows corresponding data broken down into the three separate weekly test period. There was a steady increase in spelling errors as a greater number of more complicated correspondences and rules were introduced. The number of omissions remained fairly constant.

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[2]This includes unreadable answers and answers which had no relation to dictated spelling words such as "tap" spelled bahbr.

[3]A few of these made letter reversals only (e.g., p spelled q).

TABLE II

OVERALL CORRECT AND INCORRECT RESPONSES BY TESTING PERIOD

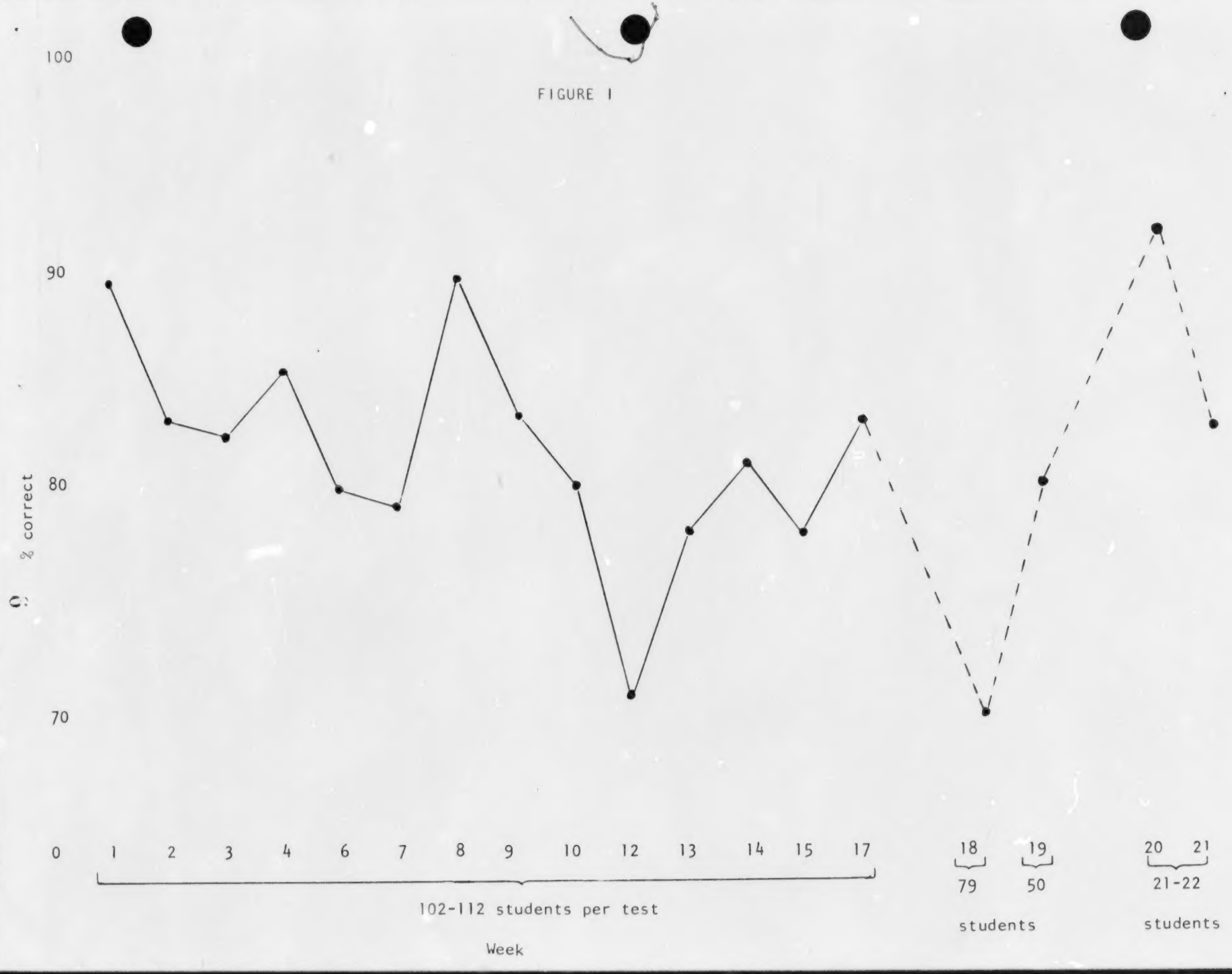
Testing Period	Correct Responses	Whole Word Omissions	Misspellings
Weeks 1-4	84%	5%	11%
Weeks 6-10	82%	5%	13%
Weeks 12-21	78%	6%	16%

From 1 to 2% of the misspellings were accounted for by letter reversals alone. The reversals d written b and b written d were consistently the most frequent sources of word errors caused by letter reversals alone. Other letter reversals made rather frequently were p written q and s written z or vice versa. Letter reversals resulting in non-letters (e.g., f written ⅎ) were made, but very infrequently.

Performance on Individual Tests and Words

Appendix A summarizes student performance on each of the spelling tests and on individual words on each test. The percentage of correct responses per test ranged from 70 to 91. Figure 1 plots student performance on each test. It can be seen that earlier tests were somewhat easier and that later tests were more difficult with the exceptions of tests 20 and 21 which were taken at the end of the year by a single class. Tests given during weeks 12 and 18 were notably more difficult for students than the other tests. This may have been

FIGURE 1


100
90
80
70
0
% correct
1
2
3
4
6
7
8
9
10
12
13
14
15
17
18
19
20
21
79
students
50
students
21-22
students
102-112 students per test
Week

because the -ack/-ake distinction appeared on test 12 and the suffixes, -ing, -er, and -ed were tested on 18. Both were particulary difficult spelling problems for the children, the latter perhaps only because suffixes formed long words. Otherwise, tests were of approximately equal difficulty. Although students did well in general, they did not average over 90% correct on any of the tests, with the exception of test 21 which was taken by only one class.

It can be seen in Appendix A that length was one important determiner of word difficulty. Longer words were harder to spell. Transfer words (words which were not taught as wholes but for which initial consonants and elements were taught separately) were considerably more diffcult than words taught and practiced during the week. The mean percent correct for transfer words was 70% while the mean percent correct for other words was 84%. (Sight words and words learned as initial consonant plus word element had approximately the same mean percent correct.) Therefore, students were perhaps not learning initial consonants and elements as well as they should have been for the purposes of transfer.

Errors Made on Individual Correspondences and Word Elements

Of the individual sound-to-spelling correspondence occurrences, 87% were correctly spelled. During weeks 1-4, 92% were correctly spelled, during weeks 6-10, 89% were correctly spelled, and during weeks 12-21, only 83% were correctly spelled. This is understandable as many ususual vowel correspondences (e.g., [ə] → o as in "from") had been introduced by the final section of the spelling program.

Appendix B lists correspondences and error rates by testing period and by position. Those correspondences found only in sight words are not listed as it was assumed that children did not learn them as sound-to-spelling rules.

Appendix B shows that (excluding correspondences which occurred in tests 20-21 only) initial consonants were the easiest to spell. Final consonants (including final consonants in clusters) were more difficult than initial or medial[4] consonants. Vowels appear more of a spelling problem than consonants and, within the former group, short vowels were easier to spell than long vowels. All, however, were easier to spell than elements, which had error rates up to 54%.

It is difficult to interpret the fact that children made more errors on word elements than on the single sound-spelling correspondences concerned. To some degree, this would be expected. Certainly there is a higher probability of error when two or three letters must be written correctly and in the right order. However, since children had supposedly learned the elements as "sounds" or units, the error rate seems rather high. This may indicate that they were not learning the elements as units, but this needs further investigation. It could be that the restriction to teaching by elements is not an efficient policy (cf, Cronnell, 1971b).

Recurring Errors, Error Types and Suggestions for Error Reduction

A tabulation of recurring correspondence substitution errors

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[4]"Medial," in this paper is defined as a post consonantal consonant (e.g., r as in "bride") or the first member of a final cluster (e.g., n as in "land").

(including single letter omissions) is made in Appendix C. An error is listed there only if four or more students made it within one or more testing periods. Errors which did not occur in an isolated item and which accounted for at least 5% of the total spellings of a certain sound and for at least 20% of the total incorrect spellings of that sound are listed in Table III. The testing period in which the common error occurred is also indicated.

TABLE III

COMMON CORRESPONDENCE ERRORS

Correspondence	Error	Test Period
Consonants		
[d] → d--final cluster (e.g., "land")	ø[5]	weeks 1-4; weeks 12-21
[k] → k--initial (e.g., "kill")	c	weeks 6-10
[k] → k--final (e.g., "take")	ck	weeks 12-21
[k] → ck (e.g., "rack")	k	weeks 12-21
[n] → n--medial (e.g., "land")	ø	weeks 1-4; weeks 6-10; weeks 12-21
[s] → s--medial (e.g., "vest")	ø	weeks 6-10
[š] → sh--initial (e.g., "shop")	s	weeks 1-4
[hw] → wh (e.g., "where")	w	weeks 12-21

[5] "ø" refers to a letter omission.

Correspondence	Error	Test Period
Vowels		
[æ] → a (e.g., "rack")	a...e	weeks 12-21
[ɛ] → e (e.g., "beg")	a	weeks 6-10; weeks 12-21
[ɪ] → i (e.g., "tin")	e	weeks 6-10
[i] → ee (e.g., "need")	e	weeks 12-21
[ay] → i...e (e.g., "bride")	i	weeks 12-21
[o] → o...e (e.g., "woke")	o	weeks 12-21
[(y)u] → u...e (e.g., "cute")	u	weeks 12-21
[ər] → ur (e.g., "burn")	o or	weeks 12-21
Suffixes		
-ed (e.g., "needed")	ø	weeks 12-21
-ing (e.g., "bringing")	ø	weeks 12-21

There are several categories of errors which children were making on tests in the First-Year Spelling Tryout. The several categories appear to stem from various causes and may require unique handling to reduce error rates.

Some of the spelling problems may stem from difficulty in discriminating sounds and thus in writing the correct correspondences.

Early in the program, especially, some children confused similar sounding consonants (at word ends even when they had little trouble with the same consonants at the beginnings of words). Confusions often occurred between letter correspondences of two sounds that were voiced- voiceless pairs (e.g., [d]-[t], [f]-[v], [b]-[p]) or within pairs which were phonetically similar in other ways (e.g., [p] and [h] are both voiceless and heavily aspiriated, [θ] and [f] both have a low fricative quality and [m] and [n] are both nasals). [θ] and [f] are so similar acoustically, in fact, that minimal pairs distinguished by those sounds only are probably best not tested in transfer words. Only previcus familarity with word pairs such as "fin" and "thin" would adequately determine that children would spell them correctly. Minimal pair listening, production and spelling drills could help to point up the contrasts between such pairs as "bad"-"bat," "cub"-"cup," "fat"-"vat."

The vowel distinction [ɛ] - [æ] appears to be a particularly difficult one for children. They often spelled [ɛ] as a. It may be that such following consonants as [g] or [k] would pull the vowel sound back in their mouths and make it difficult to distinguish from [æ] but this explanation is not adequate, as the confusion occurred in other environments as well. It is doubtful that the vowels are not distinguished at all in the children's speech; therefore, minimal pair contrasts (e.g., "pen"-"pan" or "beg"-"bag") might help them to notice the difference and relate each sound to its own common letter

correspondence. The same may not be true of a vowel confusion such as [ɛ] - [ɪ]. It is highly likely that the children's local regional dialect obliterates that vowel distinction before nasals (Metcalf, forthcoming). Therefore, the spelling error rates on such word pairs as "tin"-"ten" would probabl, not be reduced by listening drills. They would have to be learned in lists or as sight words. The same is true for words the spellings of which are determined by the [hw] - [w] pronunciation distinction (e.g., "when" or "went"). The [hw] sound does not often occur in the speech of young Southern Californians (Metcalf, forthcoming).

The [a] - [ɔ] distinction, on the other hand, may cause spelling problems for children who have it in their speech. In Southern California, many children can be validly taught that [a] → o in all environments, even before g. Those children whose dialects cause them to pronounce og as [ɔg], however, may become confused about the spelling of such words as "fog" or "log" especially if they are given as transfer words. Teachers should at least be made aware of the possible effects of these local dialect influences upon spelling output.

Letter omissions may also result from a problem in discrimination or production for many children. Omissions of final consonants (e..g, n, p, t, or sh) occurred ocasionally as did omissions of the second member of final consonant clusters (t and d). Post consonantal r was also omitted in several cases (e.g., "bride" spelled bide). Medial consonants (r and n) which are the first members of final clusters were often omitted from the spelling, (e.g., "land" spelled "lad"). Perhaps oral-aural discrimination and spelling drills on

such pairs as "sad"/"sand" or "pat"/"past" would reduce spelling errors.

In many cases, especially in earlier tests, children omitted word endings. This may be an indication that they give up on words they find difficult, however, rather than that they do not hear the word endings. The omission of suffixes was a serious spelling problem and more emphasis should be put on listening for the endings and understanding their meanings.

Some spelling errors probably occurred because children had not learned the correspondence rules well enough. Long-short vowel errors, for example, were probably not made because of inability to distinguish sounds. After long vowels were introduced, considerable confusion occurred as to whether to add a final silent e or not. In general, errors were made by omitting the final silent e but, in some cases, (notably when both the long and short vowel occurred in the same environment in the same lesson; hid-hide, for example) a short vowel was written with a final silent e. The [æk] - [ek] contrast (as in "rack" - "rake") caused great confusion but it was probably not as much an inability to hear the difference as it was to remember which was spelled ack and which was spelled ake. It appears that much contrast work (both aural and written) is needed before children relate the long-short vowel pairs to their correct spellings. Whether the distinctions are better learned together or apart is not clear but seems to be an important question to consider.

As Read (1971) reported in a study of pre-school children's spellings, there is some tendency for children to spell vowel sounds as they correspond to letter names. For example, the sound [ɪ] is

heard at the beginning of the letter name e. Many errors on the correspondence [ɪ] → i were because children spelled it with e. Similarly, the sound [ɛ] is heard at the beginning of the letter name a. Many errors on the correspondence [ɛ] → e are accounted for by the spelling a. [ay] was sometimes spelled ie, a perfect letter name substitution (although it may be a letter position reversal in a word such as ripe). Although not listed in Appendix C because it occurred only in a sight word, the [e] of "they" was commonly spelled ay or ae, again, letter name influences. These could perhaps be reduced by the teachers' referring to letters in terms of their sounds rather than in terms of their letter names.

Other recurring spelling errors appear to be unrelated to questions of sound perception or production.

Sounds which had two possible spellings were confusing (e.g., [l] → l or ll, [o] → o, oe, ow, or o...e, [w] → w or wh, [ər] → er, ir, or ur, [k] → c, k, or ck). Some of this confusion could be alleviated by emphasis on environmental constraints (e.g., [k] → c before a, u, and o, k before i and e, and ck after short vowels at the end of a word). Where no environmental constraints exist and dialect does not differentiate the sounds (e.g., [w] → wh or w), memorizing words in lists or as sight words would seem to be the only answer.

Digraphs (e.g., sh, ch, ng, ck) were more difficult to spell than the single letters making them up and the most frequent errors were omission of one letter or the other of the pair (e.g., [š] spelled s or h, [ŋ] spelled n or g, [č] spelled c, final [k] spelled c or k).

Sometimes sh and ch were confused, which is understandable considering their phonetic similarity. Visual memory should probably be stressed to alleviate digraph misspellings.

Letter position reversals were common when r was involved (e.g., "from" spelled form). Perhaps children hear an intrusive vowel between consonants and [r]. Reversals were also common when rare vowel correspondences occurred (e.g., "does" spelled dose or "said" spelled siad). This may indicate a need for more visual emphasis.

Uncommon vowel correspondences were often spelled wrong as children wrote the letter they had first learned to correspond to the sound. They were transferring sound-spelling rules already learned (e.g., [ə] spelled u in the word "was" or [a] spelled o in the word "want") without remembering that certain spelling items were "sight words." Such overgeneralizing could be curbed by stressing the "irregular" nature of words with such uncommon vowel correspondences. Words might be presented in some distinct manner that would make it clear that they were to be learned by sight rather than by sound (cf, Cronnell, 1971a).

Although the spelling errors made by participants in the First-Year Spelling Program tryout showed that elements were difficult for children to spell, there was not much consistency in the errors that were made on word elements taught and tested. There were only a few elements which were tested by at least 100 spelling responses and which had a single substitution occurring for 5% or more of those responses. These elements and their commonly occurring substitutions appear in Table IV.

TABLE IV

COMMON ELEMENT SUBSTITUTIONS

Element	Common Substitution	Percentage of Responses Accounted for by that Error
ide	id	15%
eg	ag	11%
ack	ake	9%
ack	ak	8%
in	en (77% on "tin")	8%
ake	ack (all on "take")	8%
ipe	ip	8%
ed	ad	8%
et	at	7%
en	an	7%
eed	ed	7%
ine	in	6%
oke	ok	5%
ill	ell	5%
Just below 5% are the following substututions		
ake	acke (all on "take")	4.7%
ube	ub	4.6%
ong	og (92% on "longer")	4.4%

It should be noted that the element errors shown in Table IV are really only single letter errors which may indicate again that children learned to spell by single correspondences rather than by whole elements. The errors may well be reduced by aural and written contrast exercises (e.g., "beg" - "bag"). Whether or not other elements would be more often spelled correctly if contrasted with elements previously learned cannot be substantiated by analysis of the tryout results.

APPENDIX A

PERFORMANCE OF 121 STUDENTS ON WEEKLY SPELLING TESTS

	Word	Correct Responses	Omissions and Unrelated Responses[1]	Other Errors[2]
Test I--(taken by 107 students)	at	93%	3%	3%
	bat	91%	3%	7%
	am**	91%	7%	2%
	sad	89%	3%	8%
	hat	89%	5%	7%
	bad	87%	4%	9%
	sat	86%	7%	7%
	had	83%	7%	9%
	Test I totals	89%	5%	6%
Test II--(taken by 112 students)	man	93%	4%	4%
	rag	88%	7%	5%
	tag	86%	7%	7%
	tan*	83%	10%	7%
	ran	81%	8%	11%
	tap	79%	7%	13%
	map	79%	8%	13%
	hag*	77%	16%	7%
	Test II totals	83%	8%	8%
Test III--(taken by 107 students)	fat	91%	5%	5%
	and	88%	7%	6%
	past	85%	7%	8%
	last	83%	7%	10%
	fast	82%	9%	8%
	land	82%	7%	11%
	sand	79%	7%	15%
	pad*	79%	8%	12%
	band*	75%	7%	19%
	pan[3]	75%	7%	18%
	Test III totals	82%	7%	11%

[1]All responses unrelated to the stimulus word are counted as omissions.

[2]All letter reversals are counted as errors.

[3]This word appears particularly difficult as it was dictated between "band" and "land". Many students spelled it pand.

*Transfer words.

**Sight words.

	Word	Correct Responses	Omissions and Unrelated Responses	Other Errors
Test IV--(taken by 110 students)	do**	89%	5%	6%
	to**	88%	2%	10%
	top	88%	3%	9%
	rot*	86%	6%	7%
	pat	85%	4%	11%
	dot	85%	5%	9%
	shot	85%	5%	10%
	tot*	83%	5%	12%
	fog	80%	5%	15%
	shop	77%	5%	18%
	Test IV totals	85%	5%	11%
Test VI--(taken by 102 students)	red	93%	2%	5%
	not	88%	4%	8%
	eat**	86%	5%	9%
	bed	86%	3%	11%
	got	84%	7%	9%
	log	82%	4%	14%
	net	82%	6%	12%
	get	80%	7%	13%
	beg	76%	5%	19%
	shed*	66%	8%	26%
	peq*	58%	7%	35%
	Test VI totals	80%	5%	15%
Test VII--(taken by 105 students)	the**	93%	4%	3%
	yes**	90%	5%	6%
	yell	89%	6%	6%
	ten	85%	5%	10%
	tell	80%	4%	16%
	this**	74%	10%	15%
	pest*	73%	7%	20%
	than	73%	5%	22%
	then	69%	10%	22%
	den*	62%	8%	30%
	Test VII totals	79%	6%	15%

	Word	Correct Responses	Omissions and Unrelated Responses	Other Errors
Test VIII--(taken by 106 students)	run	96%	3%	1%
	cat	95%	4%	1%
	bun*	92%	5%	4%
	us**	92%	5%	3%
	up**	92%	5%	4%
	but	91%	4%	6%
	jug	86%	6%	8%
	just**	81%	5%	14%
	cast*	75%	7%	19%
	Test VIII totals	89%	5%	7%
Test IX--(taken by 104 students)	in	91%	3%	6%
	sit	88%	3%	9%
	kit	88%	5%	8%
	him	88%	7%	5%
	did	85%	7%	9%
	thin	81%	9%	11%
	vest	80%	5%	15%
	rid*	80%	7%	13%
	vet	79%	6%	15%
	tin*	70%	5%	25%
	Test IX totals	83%	5%	12%
Test X--(taken by 111 students)	zoo**	96%	2%	3%
	will	91%	5%	4%
	end	87%	5%	8%
	bill	86%	4%	11%
	wig	86%	5%	10%
	lend*	78%	7%	14%
	send	77%	5%	17%
	went**	73%	6%	21%
	zebra**	66%	5%	29%
	kill*	64%	8%	28%
	Test X totals	80%	5%	14%

	Word	Correct Responses	Omissions and Unrelated Responses	Other Errors
Test XII--(taken by 107 students)	you**	93%	6%	2%
	my**	92%	4%	5%
	name	79%	8%	12%
	happy**	78%	8%	14%
	which**	76%	7%	17%
	back	66%	8%	25%
	take	58%	7%	35%
	rack*	56%	9%	35%
	shack*	50%	12%	38%
	Test XII totals	72%	8%	20%
Test XIII--(taken by 108 students)	is**	96%	1%	3%
	his**	89%	5%	6%
	has**	85%	7%	7%
	was**	81%	8%	11%
	wipe	78%	6%	17%
	pine	75%	6%	19%
	does**	73%	8%	19%
	hide	72%	3%	25%
	hid	71%	7%	21%
	shine*	68%	6%	26%
	ripe*	67%	6%	27%
	Test XIII totals	78%	6%	16%
Test XIV--(taken by 108 students)	need	91%	6%	4%
	sheet	88%	4%	8%
	them**	88%	6%	6%
	feel**	87%	6%	6%
	are**	85%	5%	10%
	here**	85%	5%	10%
	beet*	79%	6%	14%
	help**	78%	6%	16%
	deed*	73%	7%	19%
	they**	71%	10%	19%
	said**	70%	6%	24%
	Test XIV totals	81%	6%	12%

	Word	Correct Responses	Omission and Unrelated Responses	Other Errors
Test XV--(taken by 110 students)	woke	87%	5%	8%
	so**	85%	10%	5%
	hole	85%	7%	8%
	out**	84%	6%	10%
	cute**	79%	6%	15%
	pole*	78%	12%	10%
	use	77%	11%	12%
	house**	72%	5%	24%
	sole*	71%	12%	17%
	cube**	65%	13%	22%
	Test XV totals	78%	9%	13%
Test XVII--(taken by 109 students)	long	89%	4%	7%
	wish**	87%	4%	9%
	brick	87%	2%	11%
	song	87%	3%	10%
	with**	85%	5%	10%
	chop	84%	7%	8%
	thing	83%	7%	10%
	sick*	83%	5%	12%
	bride*	63%	6%	31%
	Test XVII totals	83%	5%	12%
Test XVIII--(taken by 79 students)	why**	85%	8%	8%
	when**	80%	6%	14%
	bringing	80%	4%	16%
	there**	78%	6%	15%
	tested	76%	6%	18%
	what**	71%	6%	23%
	where**	71%	8%	22%
	longer	65%	5%	30%
	needed*	53%	9%	38%
	bending*	42%	13%	46%
	Test XVIII totals	70%	7%	23%

	Word	Correct Responses	Omission and Unrelated Responses	Other Errors
Test XIX--(taken by 50 students)	one**	90%	6%	4%
	car	90%	4%	16%
	have**	88%	4%	8%
	want**	84%	4%	12%
	part	82%	4%	14%
	dark	80%	4%	16%
	party**	80%	4%	16%
	arm	80%	4%	16%
	chart*	70%	10%	20%
	from**	70%	4%	26%
	shark*	68%	4%	28%
	Test XIX totals	80%	5%	15%
Test XX--(taken by 22 students)	bird	100%	0%	0%
	some**	100%	0%	0%
	come**	100%	0%	0%
	girl	95%	0%	5%
	say**	95%	0%	5%
	she**	95%	5%	0%
	first	91%	0%	9%
	birthday**	86%	0%	14%
	dirty**	86%	0%	14%
	shirt*	82%	0%	18%
	birch*	68%	0%	32%
	Test XX totals	91%	0%	9%
Test XXI--(taken by 21 students)	now**	100%	0%	0%
	good**	100%	0%	0%
	for**	95%	0%	5%
	how**	90%	5%	5%
	stop**	90%	0%	10%
	short	86%	0%	14%
	much**	81%	0%	19%
	hurt	67%	0%	33%
	choke*	57%	0%	43%
	burn*	52%	0%	48%
	Test XXI totals	82%	0%	18%

APPENDIX B

ERRORS MADE ON INDIVIDUAL SOUND-TO-SPELLING CORRESPONDENCES AND WORD ELEMENTS

Correspondence	Position	Number of Test Words and Error Rate					
		Weeks 1-4		Weeks 6-10		Weeks 12-21	
Consonants		Number of Test Words	Error Rate	Number of Test Words	Error Rate	Number of Test Words	Error Rate
[b] → b	initial	3	7%*	5	5%[1]*	10	7%[2]*
[k] → c	initial			2	9%*	4	10%
[č] → ch	initial					3	15%*
	final					3	16%*
[k] → ck	final					5	29%*
[d] → d	initial	2	8%	2	8%*	5	7%*
	final	4	10%*	5	11%*	9	11%*
	final cluster[3]	4	14%*	3	10%*	1	27%*

[1]Excluding "zebra" in which [b] is a syllable initial but not a word initial. Error rate for that [b] is 13%.

[2]Three of these words begin with [br]. The average error rate for [b] in that position is somewhat lower--4%.

[3]This refers to the second member of a final consonant cluster (e.g., d as in "land").

*Includes at least one transfer word.

Correspondence	Position	Number of Test Words and Error Rate					
		Weeks 1-4		Weeks 6-10		Weeks 12-21	
		Number of Test Words	Error Rate	Number of Test Words	Error Rate	Number of Test Words	Error Rate
[f] → f	initial	3	8%			4	5%
[g] → g	initial			1	7%	2	0%
	final	4	16%*	5	9%*		
[h] → h	initial	3	12%*	1	9%	11	7%
[j] → j	initial			2	8%		
[k] → k	initial			2	17%*		
	final[4]					4	21%
	final cluster					2	14%*
[l] → l	initial	2	8%	2	6%*	2	4%
	final					4	15%*
	final cluster					1	0%[5]
[l] → ll	final			5	11%*		
[m] → m	initial	3	6%			2	15%
	final	1	7%	1	10%	5	8%

[4]After a long vowel sound, as in "woke."

[5]This is not really a reliable error rate as words containing the correspondence occurred only in Tests 20 and 21, taken by only one, superior class.

Correspondence	Position	Number of Test Words and Error Rate					
		Weeks 1-4		Weeks 6-10		Weeks 12-21	
		Number of Test Words	Error Rate	Number of Test Words	Error Rate	Number of Test Words	Error Rate
[n] → n	initial			2	6%	4	8%*
	medial[6]	4	14%*	4	13%*	2	18%*
	final	4	15%*	9	9%*	4	14%*
	final cluster					1	10%*
[ŋ] → ng	final					5	13%
[p] → p	initial	4	8%*	2	13%*	4	8%*
	final	4	14%	1	6%	4	7%*
[r] → r	initial	3	7%*	3	4%*	2	10%*
	medial			1	17%[7]	11	10%[8]*
	final					6	10%
[s] → s	initial	3	6%	2	5%	8	7%*
	medial	3	14%	4	11%*	2	9%

[6]This refers to the first member of a final consonant cluster as n in "land."

[7]The item is "zebra." This is a post consonantal rather than medial as previously defined.

[8]This is a combination of four post consonantal [r]'s (11% error) and seven pre-consonantal [r]'s in final clusters (10% error).

Correspondence	Position	Number of Test Words and Error Rate					
		Weeks 1-4		Weeks 6-10		Weeks 12-21	
		Number of Test Words	Error Rate	Number of Test Words	Error Rate	Number of Test Words	Error Rate
[š] → sh	initial	2	11%	1	17%*	7	13%*
[t] → t	initial	6	7%*	3	5%*	2	8%
	final	10	9%*	9	7%	5	10%*
	final cluster	3	11%	5	11%*	10	8%*
[θ] → th	initial			1	19%	1	13%
[ð] → th	initial			4	12%	3	11%
[v] → v	initial			2	9%		
[w] → w	initial			2	6%	6	7%
[hw] or [w] → wh[9]	initial					5	15%
[y] → y	initial			2	5%		
[z] → s[10]	final					6	11%

[9]All these exemplars were sight words but the correspondence was included because of the high frequency of those sight words (e.g., "what").

[10]Again, all exemplars are sight words but of high frequency (e.g., "was").

Correspondence	Number of Test Words and Error Rate					
	Weeks 1-4		Weeks 6-10		Weeks 12-21	
Vowels and Suffixes	Number of Test Words	Error Rate	Number of Test Words	Error Rate	Number of Test Words	Error Rate
[æ] → a	7	10%*	3	14%*	5	20%*
[ɛ] → e			20	17%*	5	20%*
[ɪ] → i			13	14%[11]*	10	12%
[a] → o	7	10%*	2	12%	2	8%
[ə] → u			7	7%*	1	19%
[e] → a...e					2	26%
[i] → ee					6	14%*
[ay] → i...e					6	25%*
[o] → o...e					5	19%*
[(y)u] → u...e					3	22%
[ɔ] → o	1	12%	1	15%	3	8%
[ɚr] → ar					9	14%*
[ər] → ir					7	9%[12]*

[11]Although in most cases, initial vowel error rates and medial vowel error rates were much the same, in this case, initial [ɪ] had only an 8% error rate and medial [ɪ] had a 15% error rate. However, single initial [ɪ] was tested only in the relatively simple word "in," this is understandable.

[12]This is not really a reliable error rate as words containing the correspondence occurred only in Tests 20 and 21, taken by only one, superior class.

Correspondence	Number of Test Words and Error Rate					
	Weeks 1-4		Weeks 6-10		Weeks 12-21	
	Number of Test Words	Error Rate	Number of Test Words	Error Rate	Number of Test Words	Error Rate
[or] → or					2	11%[12, 13]
[ər] → ur					2	40%[12]
-ed					2	24%*
-er					1	19%
-ing					2	16%*
Elements						
-ad	4	11%*				
-ack					3	37%*
-ag	3	16%*				
-ake					1	42%
-ame					1	21%
-an	4	16%*	1	23%		

[13] In medial position, this correspondence was much easier than in final position. In medial position there were 5% errors and in final position in the sight word "for," the error rate was 14%.

Correspondence	Number of Test Words and Error Rate					
	Weeks 1-4		Weeks 6-10		Weeks 12-21	
	Number of Test Words	Error Rate	Number of Test Words	Error Rate	Number of Test Words	Error Rate
-and	4	18%*				
-ap	2	17%				
-ar					1	8%
-ark					2	20%*
-art					2	21%*
-ast	3	15%	1	21%*		
-at	6	9%	1	4%		
-ed			2	15%*		
-eed					3	19%*
-eet					2	12%
-eg			2	28%*		
-ell			2	14%		
-en			3	23%*		
-end			3	17%*	1	54%*
-ent						

Correspondence	Number of Test Words and Error Rate					
	Weeks 1-4		Weeks 6-10		Weeks 12-21	
	Number of Test Words	Error Rate	Number of Test Words	Error Rate	Number of Test Words	Error Rate
-est			2	20%*	1	22%
-et			3	19%		
-ick					2	13%*
-id			2	15%*	1	29%
-ide					2	31%*
-ig			1	14%		
-ill			3	14%*		
-in			3	17%*		
-ine					2	24%*
-ing (in monomorphemes)					2	15%
-ipe					2	25%*
-irch					1	27%*, [12]
-ird					1	0%[12]
-irl					1	0%[12]
-irst					1	9%[12]

Correspondence	Number of Test Words and Error Rate					
	Weeks 1-4		Weeks 6-10		Weeks 12-21	
	Number of Test Words	Error Rate	Number of Test Words	Error Rate	Number of Test Words	Error Rate
-irt					1	18%*, 12
-it			2	10%		
-og	1	18%	1	18%		
-oke					2	18%*
-ole					3	21%*
-ong					3	16%
-op	2	15%			1	12%
-ort					1	10%12
-ot	4	18%*	2	13%		
-ug			1	12%		
-un			2	6%*		
-urn					1	48%*, 12
-urt					1	33%12
-use					1	23%
-ut			1	8%		

APPENDIX C

RUCURRING CORRESPONDENCE SUBSTITUTION ERRORS

Correspondence	Position	Error	Common Error(s)					
			Weeks 1-4		Weeks 6-10		Weeks 12-21	
Consonants			% of Total Occurrences	% of Total Errors	% of Total Occurrences	% of Total Errors	% of Total Occurrences	% of Total Errors
[b] → b	initial	p	2%	24%	1%[1]	12%		
		b[2]			1%	15%		
[č] → ch	initial	c					3%	22%
	final	sh					3%	17%
[d] → d	final	t	2%	16%			1%	6%
		d	2%	21%	2%	23%	2%	22%
	final cluster	t	2%	13%	1%	12%		
		d	5%	33%	2%	21%	12%	44%
[g] → g	final	t	2%	11%	2%	23%		
		d	2%	11%	2%	17%		
		g			1%	9%		
	initial	g			3%	39%		
[k] → c	initial	k			3%	37%	2%	18%

Note: Errors are listed in this table only if they were made by 4 or more students during any one testing period. Crossed out sections indicate that the correspondence did not occur during that testing period. Blank sections indicate that that particular error was not made on the correspondence during that testing period.

[1]All accounted for by the word "beg." "Peg" was on the same test.

[2]All accounted for by the word "zebra" where [b] is not the first sound of the word.

Correspondence	Position	Error	Common Error(s)					
			Weeks 1-4		Weeks 6-10		Weeks 12-21	
			% of Total Occurrences	% of Total Errors	% of Total Occurrences	% of Total Errors	% of Total Occurrences	% of Total Errors
[k] → k	initial	c			9%	53%		
	final	ck					7%	33%
		c					3%	12%
		ø					2%	8%
	final cluster	ck					4%	29%
[k] → ck	final	k					12%	42%
		ø					3%	8%
		c					1%	5%
		kc					1%	5%
[l] → l	final	ø					3%	31%
		ll					2%	25%
[l] → ll	final	l			2%	20%		
		ø			2%	14%		
[n] → n	medial	ø	5%	37%	5%	41%	5%	26%
		m	1%	7%				

Correspondence	Position	Error	Common Error(s)					
			Weeks 1-4		Weeks 6-10		Weeks 12-21	
			% of Total Occurrences	% of Total Errors	% of Total Occurrences	% of Total Errors	% of Total Occurrences	% of Total Errors
[n] → n	final	Ø	2%	12%	2%	17%	3%	23%
		nd[3]	3%	17%				
		m	1%	6%				
		t			1%	7%		
[ŋ] → ng	final	Ø					2%	13%
		g[4]					4%	27%
		n					1%	5%
[p] → p	initial	h	1%	14%	2%	19%		
		b			2%	19%		
	final	Ø	3%	21%			3%	39%
		t[5]	3%	25%				

[3]All accounted for by the word "pan" dictated between "band" and "land."

[4]Nearly all accounted for by the word "longer."

[5]Nearly all accounted for by the word "shop." "Shot" was on the same test.

Correspondence	Position	Error	Common Error(s)					
			Weeks 1-4		Weeks 6-10		Weeks 12-21	
			% of Total Occurrences	% of Total Errors	% of Total Occurrences	% of Total Errors	% of Total Occurrences	% of Total Errors
[r] → r	medial	ø					3%	35%
	final	ø					2%	23%
	post consonantal	ø			5%	26%	2%[6]	18%
[s] → s	medial	ø	3%	29%	5%[7]	38%		
[š] → sh	initial	s	5%	29%	3%	26%	3%	26%
		h	4%	24%	2%	22%	2%	16%
		ch					1%	9%
	final	ø					4%	31%
[t] → t	final	ø	1%	16%	3%	30%	1%	12%
		p			1%	5%		
		d					1%	8%
	final cluster	ø	3%	27%	3%	24%	2%	20%
		d or dd	1%	7%	1%	12%		
[θ] → th	initial	f[8]			8%	40%		
	final	ø[9]					5%	31%

[6]Nearly all accounted for by the word "from."
[7]All accounted for by the word "zebra."
[8]Accounted for by one word--"thin."
[9]Accounted for by one word--"with."

Correspondence	Position	Error	Common Error(s)					
			Weeks 1-4		Weeks 6-10		Weeks 12-21	
			% of Total Occurrences	% of Total Errors	% of Total Occurrences	% of Total Errors	% of Total Occurrences	% of Total Errors
[ð] → th	initial	t	3%	25%				
		h	1%	10%				
[v] → v	initial	f	2%	21%				
[w] → w	intial	wh					1%	13%
[hw] or [w] → wh	initial	w					5%	34%
[z] → s	final	ø					2%	14%
Vowels								
[æ] → a	medial	ø	2%	16%	3%	21%	4%	21%
		e			3%	23%	1%	5%
		u			2%	12%		
		a...e[10]					5%[10]	22%
[ɛ] → e	initial	a			4%	33%		
	medial	ø			2%	9%	2%	11%
		a			7%	38%	5%	25%
		i			2%	10%	1%	4%
		e...e					1%	4%

[10] All accounted for by the -ack/-ake contrast.

Correspondence	Position	Error	Common Error(s)					
			Weeks 1-4		Weeks 6-10		Weeks 12-21	
			% of Total Occurrences	% of Total Errors	% of Total Occurrences	% of Total Errors	% of Total Occurrences	% of Total Errors
[ɪ] → i	initial	e			4%	50%		
	medial	a			1%	8%	1%	9%
		e			6%	38%	1%	6%
		ø			2%	10%	3%	14%
		ie					1%	4%
[a] → o	medial	e			3%	21%		
		a	2%	23%	2%	17%		
		ø	2%	19%				
[ə] → u	medial	ø			3%	19%		
		a			1%	12%		
		e			1%	12%		
[e] → a...e	medial	ø					2%	7%
		a					11%	41%
		e					2%	7%
[i] → ee	medial	ø					1%	8%
		e					5%	39%

Correspondence	Position	Error	Common Error(s)					
			Weeks 1-4		Weeks 6-10		Weeks 12-21	
			% of Total Occurrences	% of Total Errors	% of Total Occurrences	% of Total Errors	% of Total Occurrences	% of Total Errors
[ay] → i...e	medial	Ø					2%	9%
		i					12%	48%
		e					1%	3%
		ie					1%	5%
[o] → o...e	medial	o					5%	27%
		oe					1%	6%
		ow					1%	8%
[yu] → u...e	initial	y or[11] y + V					5%	20%
[(y)u] → u...e	medial	u					6%	26%
		oe					2%	11%
[ɔ] or [a] → o	medial	a	4%	31%	4%	27%		
		e[12]			7%	47%		
		i					1%	21%

[11] Accounted for by one word only--"use."

[12] Accounted for by one word only--"log."

Correspondence	Position	Error	Common Error(s)					
			Weeks 1-4		Weeks 6-10		Weeks 12-21	
			% of Total Occurrences	% of Total Errors	% of Total Occurrences	% of Total Errors	% of Total Occurrences	% of Total Errors
[ar] → ar	medial	∅					3%	19%
		o					2%	13%
		e					2%	15%
[ar] → ir	medial	er					3%	36%
[ar] → ur	medial	r					10%	24%
		or					10%	24%
-ed	suffix	∅					10%	39%
		id					3%	13%
-er	suffix	∅					9%	47%
-ing	suffix	∅					5%	31%

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